

## THE USE OF COCAINE IN SURGERY.

BY J. SHELTON HORSLEY, M.D., RICHMOND, VA., PROFESSOR OF PRINCIPLES OF SURGERY AND CLINICAL SURGERY IN THE MEDICAL COLLEGE OF VIRGINIA;  
SURGEON TO MEMORIAL HOSPITAL.

Cocaine has such an extended field that it is the object of this paper merely to touch upon some of the more common uses that may arise in the daily work of the general surgeon. Aside from its direct absorption from a raw surface or from a mucous membrane, the application of cocaine may be divided into three different methods. First, the intra-spinal, which consists of the injection of a solution of cocaine under the dura of the spinal cord. This method has been largely used in this country by Morton, of San Francisco, who has very greatly perfected the technic. However, it is somewhat uncertain, as even in skilled hands there are occasional failures to produce anesthesia. The possibilities of injuring the cauda, or of causing a hemorrhage, or introducing sepsis and so starting a meningitis, are things that may very rarely happen, but cannot be entirely overlooked. But the chief objection is that the cocaine must be used in a strong solution, preferably dissolved in the spinal fluid itself. When individuals have a marked idiosyncrasy for cocaine, as occasionally happens, it would be impossible to recover the cocaine injected intra-spinally, and the rapid absorption of the strong solution might readily be fatal.

In the second method, called "regional anesthesia," the cocaine is injected into the trunk of a sensory nerve, and so blocks sensation over the distribution of the nerve. This method is nearly always combined with the third method, which depends upon the injection into the tissue to be operated upon, whereby the nerve terminals are affected. This is, strictly speaking, local anesthesia. In either the regional anesthesia or the local

anesthesia, the amount of cocaine can be regulated to suit the needs of the operator, or what has already been injected can be partly recovered by incising the tissue rapidly, if symptoms of poisoning arise. Then, too, in these last methods, the solution can be used in much greater dilution than in the case of spinal anesthesia.

In operating upon the skin a solution not stronger than one-fifth of one per cent. is all that is necessary. In deeper structures this solution may be diluted to one half this strength. The amount of cocaine used should be accurately measured, and should never exceed one grain. Usually a half grain is all that is necessary in most operations, even in such procedures as an operation for the cure of hernia. The most satisfactory results are obtained by freshly prepared solutions. It has been my practice to have cocaine crystals put up in powder, each powder containing one grain. If necessary these powders may be sterilized by dry heat, though if the cocaine crystals are fresh, this is not essential. Warm water is more effective than cold. In an ounce of warm water is dissolved the contents of one of these powders, which makes about one-fifth of one per cent. solution. In injecting the skin, care must be taken to place the solution in the substance of the skin itself, and not in the subcuticular tissue. Each injection should produce a wheal, as in urticaria. If injected beneath the skin all of the nerve filaments are not reached until a large amount of infiltration has been produced. In very sensitive patients it is well to place a drop of carbolic acid at the intended point of injection. This procedure deadens the first prick of the needle. After

a sufficient amount of skin has been anesthetized the solution should be still further diluted, and the subcutaneous tissue injected with a more generous supply of the solution. This should be done before incising the skin, as the loose connective tissue and subcutaneous fat is much easier to infiltrate before the skin has been cut than afterwards. In operations upon an extremity a tourniquet should be first applied and the region of the nerves injected with a weak solution. Amputations of the fingers or toes can be done entirely painlessly by first injecting the skin in the manner suggested, after applying a rubber band as tourniquet, and then infiltrating with a weak solution around the four points of the nerve supply.

The most successful kind of major operations performed under cocaine is the operation for the radical cure of hernia. In a patient suffering from inguinal hernia the disabilities are great. The chief objection to an operation made by most of these patients is the fear of a general anesthetic. In the young and healthy such a fear has no serious foundation, but in elderly people, in those who use alcohol constantly, or in patients with nephritic disease, the danger of a general anesthetic looms up prominently. In these classes of cases the radical cure under cocaine is particularly indicated. I have operated with cocaine more than thirty times for the radical cure of hernia. Two of the patients were seventy years of age, and one of these had a double hernia. At least ten of these patients were over sixty. There was no death and no serious complication after any of these operations. Union took place by first intention in every instance with two exceptions, where a very mild infection occurred along the skin edges, but did not materially interfere with the progress of the case. In all the cases I have been able to follow there has been no recurrence. It is quite likely that the bodily resistance is much decreased by the use of a general anesthetic, and this, to-

gether with the straining on the sutures incident to vomiting after ether, predisposes to suppuration to a much greater extent than the infiltration of the tissue with the weak cocaine solution. As Bodine and Mitchell have pointed out, tissues are handled more gently under cocaine than when a general anesthetic is employed, and this, too, favors healing by first intention. Taking away, then, the danger of the general anesthetic and the risk from sepsis, the radical cure of hernia should be without mortality. The technic employed in these cases has been as follows:

The skin is infiltrated with a one-fifth of one per cent. cocaine solution, the incision being a little higher than is usually the case. The subcutaneous tissue is injected with a one-tenth of one per cent. solution. After incising the skin the fascia of the external oblique is split at the outer angle of the incision, and the ilio-inguinal nerve found and injected with a one-fifth of one per cent. solution of cocaine. The ilio-inguinal nerve usually lies below the incision, and the ilio-hypogastric just above it, though the relation of these nerves is not constant, and their accurate detection will require experience in clinical work or dissections upon the cadaver. The incision is then extended down toward the pubis, and the inguinal canal opened. The tissue around the internal ring is infiltrated, and the sac dissected out. Dissection of the sac should be done largely with sharp scissors. Ligation of the sac often causes some pain, but frequently is done without inconvenience. The pain here, however, when it occurs is slight and of short duration. The operation is usually concluded after the method of Ferguson, which consists in suturing the conjoined tendon and the external oblique to Poupart's ligament without transplanting the cord.

Other abdominal operations may be done under cocaine, but they are often of doubtful propriety except in unusual instances, as the nerve supply can not be controlled. In

selecting a patient for operating under cocaine, due regard must be paid to the characteristics of different individuals. A patient who is naturally nervous and excitable will suffer more from mental anguish and the consciousness of knowing that he is being operated upon, than he will from actual physical pain; so it is unwise to select such cases for

cocaine anesthesia. On the other hand, it is not necessary for the individual to be a stoic. If he can keep himself moderately under control, and say when he is being hurt so that more cocaine can be used, a satisfactory and painless operation can be done, provided it is of such a character as lends itself to the employment of a local anesthetic.